Arts V. 5.

THE ART OF MAKING SUGAR:

Under the HEADS of

I. The Natural Hiſtory of the Sugar-Cane.
II. The Culture of the Sugar-Cane.
III. The Mills for preſſing the Canes; and Furnaces, Coppers, *&c.* for boiling the Juice.
IV. The Method of making Muſcovado
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VI. The Method of making Sugar from Melaſſes and Scums.
VII. The refining of Sugars.

WITH AN

APPENDIX

CONTAINING

The Art of fermenting and diſtilling MELASSES, SCUMS, *&c.* for RUM.

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THE

ART *of making* SUGAR.

CHAP. I. Deſcription and natural Hiſtory of the Cane.

1. *Deſcription of the Cane.*

THE Sugar-cane is a ſmooth jointed reed, of a ſhining greeniſh colour, which, as the plant approaches to maturity, changes by degrees into a yellow or deep popinjay. The ſize of the canes varies greatly, according to the ſoil, ſeaſon, and other circumſtances. The moſt uſual height is from four, to ſeven or eight feet; In ſome ſoils they never exceed two or three feet in height; in others they riſe to nine, ten, or more. Labat mentions ſome extraordinary ones in the French iſlands, which, without the top and lower joint, meaſured twenty-four feet in length; each of theſe weighed twenty-four pounds. The thickneſs of the middling ſize canes is about an inch; ſome of the ſmall ones are little more than an half inch thick; the largeſt three or four inches.

The diſtance betwixt the joints or knots are no leſs various than the height of the cane itſelf; and depend entirely upon the dryneſs or moiſture of the ſeaſon: thoſe produced in dry ſeaſons are very near together; thoſe in the moiſt ones farther apart; inſomuch that it may be judged from the diſtances of the knots of the cane, what kind of weather has happened at the different times of its growth. In ſome, the knots are not above two inches aſunder; in others, nine or ten. Thoſe canes, which have the knots fartheſt apart, are eſteemed the beſt.

From the joints of the cane ſpring up ſeveral ſtiff, pointed, narrow leaves, a yard or more in length, of a yellowiſh green colour, in ſhape and manner of growth exactly reſembling thoſe of the water reed. The edges of theſe leaves are ſharp, and thick ſet with ſmall teeth, which ſometimes wound the negroes that unwarily rub againſt them, in weeding the plants, *&c.* Canes of a good kind rarely hold all their leaves till they have grown to their full height; thoſe at one joint generally falling off when the ſtalk has ariſen high enough to form another. If any leaves are ſeen remaining at the lower knots, the cane is looked on as of a bad kind, or far from maturity.

The top is adorned with a number of the ſame kind of leaves, ſtanding upright all round the ſtalk; theſe are called the *flag* of the cane: the beſt ſort of canes have ſix or ſeven; others a greater number. Among theſe leaves comes forth a fine branched tuft, like thoſe of other reeds, two or three feet in length, and covered as it were with a light, whitiſh down: this tuft, from the uſes which the Indians apply it to, is called the *arrow* of the cane: when the arrow has withered and dropt off, the cane ceaſes to grow; and in a month or two after, falls to the ground, and ſtrikes root at every joint: the plant in theſe circumſtances is ſaid to be *booted*. Marcgrave and others relate, that in Brazil, the cane will ſtand two years or more after producing its tuft; but we have not heard that one and the ſame cane has ever put forth a ſecond tuft.

2. *The Qualities of the Cane.*

This uſeful Indian reed, though in external appearance much reſembling thoſe which grow wild in Europe, is nevertheleſs entirely different from them in quality. The latter are generally hard and dry, and have a diſagreeable, or merely herbaceous taſte; whilſt the former abounds with a pleaſant, rich, ſweet juice, capable of being manufactured into ſugars, wines, and vinous ſpirits.

This ſaccharine juice is contained in a ſpongy pith, which the inſide of the cane is filled with. The pith of the ſmooth part of the ſtalk is ſoft, and of a whitiſh colour; that of the joints harder, more compact, and darker coloured: the firſt is by much the moſt juicy, but the juice of the latter is ſweeteſt, and ſeems to be moſt perfectly elaborated. Hence though the fewer knots there are (other circumſtances being the ſame) the cane contains the greater quantity of juice, yet this juice is proportionably poorer of ſugar.

The roots, leaves, and tuft of this plant, manifeſt nothing of the ſweetneſs that prevails in the cane: and the top of the cane itſelf, as alſo the part below the firſt joint from the ground, are much leſs ſweet than the other parts of it; ſo as to be entirely unfit for the common uſes of the ſugar-cane.

The quantity and goodneſs of the ſaccharine juice depend greatly upon the ſeaſon, expoſure to the ſun, the ſoil, and the age or maturity of the plant itſelf. Thus, immediately after the rainy ſeaſon, the canes are found to be much leſs ſweet, than others (of the ſame age, and equal in all other circumſtances) are at the beginning of it. If theſe laſt remain uncut till ſome time after the rains have begun, they undergo a ſenſible change for the worſe, and yield a conſiderably poorer juice: whilſt the firſt, ſuffered to ſtand for ſome time after the beginning of the dry ſeaſon, become as ſenſibly richer.

The largeſt and in appearance moſt promiſing canes, which moiſt rich ſoils generally produce, abound with a thin, weak, watry juice, containing but little ſaccharine matter, and which conſequently requires a great deal of time, and fire for boiling it to the due conſiſtence; whilſt thoſe which are much ſmaller, and to the eye not near ſo beautiful (ſuch uſually are the produce of dryer, and leſs ſtrong ſoils) afford ſo rich a juice, as to require being diluted with water, to prevent its gaining the conſiſtence that diſpoſes it to *kern*, or grain, before it has been ſufficiently clarified in the boiling: but this is a circumſtance which has rarely been known to happen.

The juice of the canes, whilſt unripe, is crude, watry, and abounds with groſs unctuous matter; and is not, without the utmoſt difficulty, reducible into ſugar: this ſugar is likewiſe greatly inferior in quality to that which the canes afford when fully ripe. Nevertheleſs the unripe canes are found to anſwer ſufficiently well for fermentation, and for planting. It appears that when this reed has attained to perfect maturity, it does not for a conſiderable time after undergo any great change in quality: this we may infer from the practice of the Brazilians (as deſcribed by Piſo, Marcgrave, and Ximenes) who not unfrequently ſuffer the cane to ſtand for a year or more after it has given all the marks of being fully ripe. Labat alſo informs us, that he has found canes, which had fallen to the ground, anſwer as well for rough ſugar or muſcovado, though not for whites, as thoſe cut in the ſtate of their moſt perfect maturity.

The maturity or degree of perfection of the ſugar-cane is not to be judged of from its age or ſize alone; but chiefly from the quality of the juice. If this has a glutinous, rich, ſweet taſte; and if at the ſame time the cane be weighty, and of a good yellow colour; if the ſkin is ſmooth, dry, and eaſily breaks; the pith of a grey colour, or inclining a little to brown: the plant in theſe circumſtances may be ſaid to be in its utmoſt perfection; and we may be aſſured that it will afford a very fine ſugar, in large quantity and with little trouble.

3. *Hiſtory of the Sugar-Cane.*

It has been generally ſuppoſed, that this plant is a native only of the Eaſt-Indies; that it was brought from thence by the Spaniards and Portugueſe (who were the firſt people of Europe that traded thither) to the Madeira and Canary iſlands; and afterwards, from thoſe iſlands to Brazil, New-Spain, and other parts of America.

Some late writers ſeem to queſtion the veracity of this piece of hiſtory. Labat plainly denies it; and maintains that the ſugar-cane is as much a native of the Weſt-Indies as of the Eaſt; and that it is not the cane itſelf, but the art of making ſugar from it, that America owes to other countries.—This opinion is founded on the teſtimony of ſeveral credible travellers. One of our countrymen, Thomas Gage, relates, that "being in the bay of Guadeloupe, in the year 1625, the Indians brought him ſundry fruits, and among them ſugar-canes." None of the Europeans had at this time cultivated an inch of ground in Guadeloupe, or any of the other ſmall iſlands, called Antilles. We are told indeed that at the diſcovery of theſe iſlands in the ſecond voyage of Columbus, the Spaniards put a number of pigs into them, to afford proviſion to ſuch of their flotas as ſhould afterwards happen to ſtop there: but this very circumſtance, among many others, renders it highly improbable that they planted any ſugar-canes.—There are ſeveral more expreſs teſtimonies of the ſugar-cane being a native of America. De Laet relates, that it grows ſpontaneouſly in the iſle of St. Vincent; Ximenes, on the river de la Plata; and almoſt all thoſe who have left us any account of the river Miſſiſippi, declare that the ſugar-cane grows naturally in its neighbourhood, in great abundance. De Lery found this plant in the province of Janeiro, in 1556, which was ſome time before the Portugueſe had obtained footing in that province.

It appears therefore, that the ſugar-cane is really a native of America: the art indeed of making ſugar from it, was undoubtedly firſt known in the Eaſt-Indies; from whence the Portugueſe introduced this art into the Madeira and Canary iſlands; and towards the end of the year 1580, into Brazil and New-Spain. The other European nations had not obtained ſettlements in the American iſlands till upwards of forty years after this period; and it was a conſiderable time longer before they applied themſelves to the culture of the ſugar-canes, or the making of ſugar from them.

The Engliſh ſugar manufactures were prior to thoſe of the French. It appears from the hiſtory of our colonies, that this commodity was prepared in St. Chriſtophers and Barbadoes, in 1643. The French, who then ſhared the firſt of theſe iſlands with us, ſoon followed our example; and in 1648 had eſtabliſhed ſugar works in Martinico; and a little time after in Guadeloupe.

CHAP. II. Of the Culture of the Sugar-Cane.

1. *Of the Soil.*

This plant is produced in greateſt perfection, in light ſpongy, deep ſoils, which lie expoſed to the ſun during the whole time of his ſhining; and have juſt deſcent enough to carry off the rain water. Too much declivity is injurious, as the rains, which in the warm climates fall at certain ſeaſons, in great abundance, running haſtily off, will waſh down the mould from the root of the cane.

In ſtrong rich earths the canes grow very large, but rarely attain to perfect maturity. Their juice is very poor and watry; and has likewiſe a degree of unctuoſity, which renders its clarification ſufficiently troubleſome. The ſugar prepared from it is always ſoftiſh, ill-grained, and very ſubject to run into melaſſes. Theſe watry canes are called by the planters *naſh*.

In ſhallow worn-out grounds, where the roots of the plant ſoon reach the gravel or ſtones, the canes prove ſmall, and full of knots. Nevertheleſs, in moiſt ſeaſons, they are found to be of exceeding good quality; their juice, though in no great quantity, is extremely rich. The Portugueſe in Brazil and New-Spain plant their ſugar-canes in the poorer ſoils only, or ſuch as are exhauſted and become too poor for producing tobacco, *&c.*

Low marſhy lands, which lie nearly on a level with the ſea, afford long, large, weighty canes, which have a very beautiful appearance, but are generally of a bad quality. The ſugar prepared from them loſes greatly in refining, and can ſcarce at all be made perfectly white: its grain, though at firſt ſufficiently hard, large, clear and tranſparent, becomes in a little time moiſt, and at length quite ſoft.

Strong red earths produce fine, long, large canes; which if cut in the dry ſeaſon, and when perfectly ripe, afford a tolerably rich juice, and in large quantity. The muſcovado, prepared from this juice, is of a good grain, bears carriage well, yields an excellent white ſugar, and does not loſe ſo much in the refining as many other ſorts. Labat relates, that he has frequently found the muſcovado made from canes produced in this kind of ſoil, to afford little leſs than half its weight of pure white ſugar; but obſerves, that if the canes are not kept very clean from weeds, or if cut before they are perfectly ripe, it proves exceeding difficult to duly clarify the juice.

In lands ſurrounded by woods, or ſituated on the tops of hills, the canes are too much expoſed to rains, dews, and the night colds. Hence their juice proves crude, watry, and unctuous; and requires a good deal of time and trouble for its boiling and clarification. But this obſervation does not hold univerſally; for ſome hills in St. Chriſtopher's produce canes of an extraordinary good quality: and in general, all the canes produced on hilly grounds afford with proper care a ſugar of a good body, and large hard grain, which keeps well, and bears carriage and refining.

2. *Of rich and poor Grounds.*

Rich ſoils (ſuch generally are thoſe which have been juſt cleared from the wood) produce abundance of tall beautiful canes, whoſe juice is in large quantity, but not without great difficulty reducible into a good ſugar. Nevertheleſs, by a method of management ſomewhat different from the common, canes may be raiſed, in this kind of ſoil, of a moſt excellent quality.

In theſe grounds the cane grows to a very great height in ſix or eight months; but does not become ripe in leſs than eighteen or twenty. At the age of ſix or eight months, it is to be cut, and the leaves burnt upon the ground. The roots left in the earth ſoon put forth a great number of new ſhoots, which grow to a very large ſize, and uſually in fourteen or fifteen months attain to full maturity and perfection. The firſt cuttings anſwer ſufficiently well for fermentation, or for planting, though not for making ſugar of any kind; whilſt the ſecond afford an exceeding fine ſugar.

Labat aſſures us, that in Martinico he has found the canes planted in new ſoils fit for affording ſugar in ſix months; that he has counted from a ſingle root upwards of ſixty new ſhoots, the length of which was from ten to ſeventeen feet; that they yielded in very large quantity, and with little trouble, an extreme fine ſugar; and that himſelf and ſome others had frequently practiſed this method with the ſame ſucceſs. Hence though cutting the canes at ſix months, when they are unfit for making of ſugar, may at firſt appear to be a loſs to the planter, yet it is really of very conſiderable advantage; ſince beſides the ſpirit from the firſt crop, he has from the ſecond a much finer ſugar, and in much greater quantity than could have been otherwiſe obtained; though the new ſhoots are only a month or two longer in ripening, than the canes would have been if left uncut. As to the uſe of burning the leaves, he adds, that the ground, by this means, becomes leſs rich (ſo as to be fit for producing good canes afterwards) by the firſt crop: which it would not perhaps be by five or ſix, in the common way; where the leaves falling off, and rotting, in part reſtore to the earth the richneſs, which the plant had before deprived it of.

Burning the leaves upon the ground has a farther uſe, than what this author ſeems to have been apprized of: as they are not only thus prevented from rotting, and increaſing the unctuoſity of the earth; but likewiſe, as the aſhes ſerve to divide its tough viſcid texture, and bring it nearer to the light ſpongy ſtate which (as obſerved at the beginning of this chapter) is found to be moſt proper for the ſugar cane. All vegetable aſhes have this effect, and afford an excellent manure for fat, tenacious ſoils: though for thoſe already of a looſe, crumbly texture, they are manifeſtly prejudicial. Theſe laſt require an additional fatneſs, or unctuoſity, which is in ſome meaſure communicated to them by the leaves which fall off, and rot, during the growth of the cane.

Very poor grounds require to be well manured with dung, which is to be ſpread over them, and the lands covered with the traſh, which will make them fit for receiving the cane plants. The traſh is here of good ſervice, preventing the over-vehement action of the ſun from exhaling the moiſture of the dung, which is neceſſary to impregnate the ſoil.

Very ſtiff grounds, beſides the addition of aſhes, or other manure, we would recommend to be well ploughed, and left fallow for ſome time; which will contribute not a little to diminiſh their toughneſs.

Rich grounds may be likewiſe impoveriſhed to the degree neceſſary for producing good ſugar canes, by planting them the firſt year with ginger, Guinea or Indian corn, yams, caſſada, or the like. But as theſe may be raiſed in poorer ſoils, and ſuch as cannot without a good deal of expence be made to anſwer for the ſugar cane; it is apprehended, the method above recommended will be found conſiderably the moſt advantageous.

3. *Of the Preparation of the Ground.*

The ground deſigned for the ſugar cane muſt be well cleared from weeds, particularly that moſt deſtructive climbing kind of weeds, called *withs*, which twiſt round the canes, and kill them. Theſe ought, if poſſible, to be entirely extirpated, and carried off; as the leaſt piece, left upon the ground, ſoon ſhoots up, and multiplies very faſt.

The roots of trees, eſpecially if the wood is of ſuch a kind, as is apt to ſend up ſuckers, ſhould be either got up, or burnt, or ſcorched, ſo as to dry up their moiſture, and prevent them from ſhooting. As to the roots of other kinds of wood, it is not abſolutely neceſſary to take this trouble.

Some of the French planters lay out their grounds into a number of ſquares of an hundred yards each ſide; leaving vacant ſpaces betwixt them, about eighteen feet wide, for the paſſage of wheel carriages, *&c.* Theſe ſpaces the planters call intervals. In Jamaica, fifteen feet are held ſufficient for theſe *intervals*. The uſual ſize of the cane piece is from ten to twenty acres.—This method of laying out the ground, beſides the ornament which a plantation receives from it, is accompanied with ſome conſiderable advantages.

The carts are admitted ſufficiently near to all the parts of the plantation, for the canes, when cut, to be, with very little trouble, carried to them by hand; without their going into the piece, which does great injury to the roots left in the earth, and oftentimes entirely deſtroys them, eſpecially in rainy weather, and when the ground is ſoft. Nor is this damage eaſily repaired; freſh plants, put in the room of thoſe deſtroyed, rarely thrive, being over-grown, and killed by the more vigorous ſhoots, ſent forth by the roots around them. Hence all the cart ruts, *&c.* are generally found either quite bare, or produce only dwarf, unkindly canes, which do not ripen ſo ſoon as the others, and conſequently, if cut with them, muſt debaſe the quality of their juice.

Theſe *intervals* likewiſe ſecure againſt the ſpreading of fires (either happening from accident, or made on purpoſe) from one part of a plantation to another. To which may be added, that they allow the planter the more conveniently to examine occaſionally the different parts of the piece, to inſpect the negroes employed in weeding the canes, *&c.*

The principal objection that lies againſt this practice is, that a conſiderable part of the ground is left waſte. But ſundry uſeful vegetables, as peas, potatoes, *&c.* may be advantageouſly cultivated in all the intervals, whilſt the ſugar cane is growing; only a foot path being left at each ſide, for examining the canes, inſpecting the negroes, gathering the peas, *&c.* The only caution as to the choice of theſe plants is, that they be ſuch as may be fit for gathering, or being taken off the ground, before the ſugar cane is ripe. Nor does it appear neceſſary that ſo much ground be taken up in theſe ſpaces as is above propoſed: it ſhould ſeem ſufficient, to make roads only from end to end of the piece, at the diſtance of an hundred yards from one another; ſince the carriages, *&c.* will thus be admitted as near to the middle of each diviſion, as when a greater number of avenues are drawn acroſs.

4. *Of the Cane Plants, the Seaſon, and Manner of planting them.*

The plants uſually made choice of are pieces from fifteen to eighteen inches long, cut from the tops of the canes, a little below the *flag* or upper leaves. The more knots (or *eyes*, as they are called) theſe pieces are furniſhed with, the more ſhoots they will ſend forth; and ſome expect likewiſe, that they will the ſooner take root.

Labat obſerves, that the upper part of the cane, notwithſtanding the preference uſually given to it, ſhould ſeem to be leſs proper for this uſe than the body; ſince it is never found ſo perfect, or vigorous, and conſequently does not appear capable of producing ſuch thriving plants. And hence he informs us, that when he wanted plants, he always choſe to cut down ſome canes on purpoſe; and rejecting the tops, to employ only the more perfect pieces of the cane itſelf. Our planters, on the other hand, ſtill prefer the upper part; and alledge that the body, eſpecially of the *rattoons*, or ſlips produced after the firſt cutting, are generally too dry. Theſe two opinions may probably be reconciled, by obſerving that Labat ſeems to have taken the canes before they were ripe, and our planters not till they are fully ſo.

Labat obſerves, that the time moſt proper for planting is the rainy ſeaſon, from the beginning, till two thirds of it are paſt. It has been found from repeated obſervation, that canes planted within this compaſs not only take better, and grow to a larger ſize, but likewiſe prove ſuperior in quality, to thoſe planted at any other time. Canes planted about the middle of the rainy ſeaſon, will in four or five months overtake in growth thoſe planted near half a year before.

This obſervation cannot be rendered ſo generally uſeful as might be wiſhed: as it is neceſſary to have a conſtant ſucceſſion of ripe canes; ſo it is likewiſe neceſſary to plant them in different ſeaſons, beginning always with the poor grounds.

The manner of planting the canes is as follows: ſome time after the land has been ploughed (in ſuch as are newly ploughed, the canes will not ſtand) a number of trenches are made in the ground, about the ſame length with the cane plants: their moſt convenient depth is four or five inches, in moiſt weather; and in great droughts, ſeven or eight. In each of theſe trenches, two of the cuttings are placed; in ſuch a manner, that the end of one may ſtand about three inches out of the earth, at one extremity of the trench; whilſt that of the other does the ſame at the other extremity: after which, the trenches are filled up with the earth that was taken out of them.

Theſe trenches ſhould be laid out by a line; by which means the canes can be much more conveniently weeded, and a whole piece ſeen through from end to end. Nor will this method, when the negroes are a little accuſtomed to it, take up any more time than the random way. The diſtance betwixt the rows, and betwixt the plants in each row, may, in good ground, be about three feet and an half; in poor, worn-out grounds, two feet are ſufficient.

5. *Of the Management of the Canes after planting.*

Labat recommends weeding the canes juſt as they begin to come up, which is generally in five or ſix days: but the more experienced planters poſtpone this till the ſhoots are pretty well advanced above ground; and thus prevent the loſs of any of the canes, by being either trodden on by the negroes, or pulled up along with the weeds. The weeding is repeated, at proper intervals, two or three times, or oftner, till the canes have grown ſo large, as to keep down the weeds. At the age of five or ſix months, they are weeded again, for the laſt time.

At the time of firſt weeding, it is neceſſary to examine the piece, and if any of the plants have failed, to replace them immediately: if this be deferred longer, the freſh plants will be either over-grown and killed by the others, or will not ripen equally with them.

6. *Of the Maturity, and cutting of the Canes.*

That the canes be perfectly ripe before they are cut for the mill, is (as we have before obſerved) a point of the utmoſt importance. This period is not eaſy to be determined. The age of the plant, which Labat reports to be the only circumſtance that the French planters judge its ripeneſs from, is manifeſtly too precarious and uncertain; in ſome ſoils, the canes will ripen in ten or eleven months; in others, they require fourteen or fifteen, or more; the difference of the ſeaſons in which they are planted occaſions likewiſe a very remarkable difference in the time of their ripening. The colour of the canes is much leſs precarious; that of full ripe ones being always of a deep popinjay. But the taſte and quality of the juice are the moſt certain marks of the maturity of the cane, (*ſee Chap.* 1. §.2.) The canes ſhould be examined by taſte in different parts of the plantation: and if any are found unripe (thoſe in the middle rarely ripen ſo ſoon as the reſt) the whole ſhould be ſuffered to ſtand for ſome time longer; ſince it appears from experience, that the canes will not be injured, by ſtanding a conſiderable time after they are ripe; and that it is eaſier to make a good ſugar, from ſuch as have greatly exceeded maturity, than from thoſe which are but a little ſhort of it. If the taſte does not give ſufficient ſatisfaction, with regard to the ripeneſs of the canes, it will be proper to make an eſſay of them, by cutting a few, and boiling their juice into ſugar in the uſual manner.

The canes are cut with hand-bills, as cloſe to the ground as poſſible, then cleared from the leaves, *&c.* and cut into ſhorter pieces, from two foot and an half, to four feet in length. The chief precaution here is, that the cane be cut off ſmooth, without hacking the root; which, in the dry ſeaſon, is of great prejudice to it.

The top of the cane, to the diſtance of three or four inches below the flag, ſhould be cut off along with the leaves. Some are accuſtomed to ſave this part, and endeavour to turn the whole of the cane to advantage; but this is a piece of ill-judged frugality: the top of the cane is always green, and contains only a crude, unripe juice, which mingling with the reſt, will greatly debaſe it.

No more canes ſhould be cut at one time, than can be uſed in the ſpace of twenty-four hours. Some have ventured to cut as many as would ſuffice for three or four days; but before the end of this time, the canes heat, the juice loſes of its ſweet taſte, begins to grow ſouriſh, and can never, by any ſubſequent management, be made to afford a good ſugar. Indeed if it has become conſiderably acid, no ſugar at all is obtainable from it. Too much care therefore cannot be had, to prevent the canes, or their expreſſed juice (of which in the next chapter) from receiving this diſagreeable alteration.

In moſt of the iſlands, it is cuſtomary to cut down as many on Saturday, as will ſerve for ſome time on Monday; that the mill may begin working at midnight. In making *brown* ſugar, this advantage may be ſafely taken; but it is by no means to be recommended for *whites*: here, it is certainly more eligible, to ſuffer a retardation for ſome hours, than to endanger ſpoiling the product by the canes heating.

It has been ſuggeſted, that by keeping the canes after they are cut, till nearly upon the point of beginning to turn, a larger yield of ſugar may be obtained, than canes uſually afford, when committed to the mill as ſoon as cut down. A part of the aqueous moiſture of the plant will by this means be exhaled or dryed away, ſo as to leave the remaining juice, now leſs in quantity, proportionably richer in ſaccharine matter: but it does not ſeem probable, that the abſolute product of the ſugar ſhould be thus increaſed; or at leaſt any more than it would be by ſuffering the canes to remain a longer time in the ground. And even if keeping the canes after they have been cut, ſhould be found really to occaſion the yield to be ſomewhat larger; yet this practice is manifeſtly too hazardous to be complied with, where the canes are of a tolerable good quality, on account of the violent tendency of the ſaccharine juce to ferment and grow ſour. The *naſh* indeed, or poor watry canes, might undoubtedly be thus treated to advantage; as great part of the expence in boiling would be ſaved. This proceſs, therefore, certainly deſerves to be tried; and we conceive, that if the canes were ſpread thin, and occaſionally turned, it would ſucceed in tolerable perfection: a few trials, which will be attended with very little expence, or trouble, will ſet this matter right.

7. *Of replanting the Canes.*

In poor, worn-out, ſhallow grounds, it is neceſſary to replant the canes after the ſecond cutting: a third crop would not anſwer; this conſiſting only of ſmall ſhoots, full of knots, and almoſt void of juice.

In new, ſtrong, rich earths, the canes, according to Labat, will continue fifteen or twenty years; according to Piſo, forty or fifty, without any ſenſible diminution in the number, ſize, or goodneſs of the ſhoots: the older the roots, they ſpread the farther, and ripen their ſhoots the ſooner; provided due care be had to cover them with earth, as often as by violence in the cutting, or other accidents, they have been in part rendered bare; and to cut off ſuch parts, as are diſpoſed to rot, which would otherwiſe ſpoil the reſt. But notwithſtanding theſe obſervations, the planters rarely ſuffer the canes to ſtand above four or five crops, even in the richeſt ſoils; finding that at every cutting, the roots receive ſome injury, and conſequently that the produce of the ſugar is leſs than the piece ought to yield.

As to ruts, or tracts, where the canes have been deſtroyed by cattle, *&c.* the only expedient for ſucceſsfully repleniſhing theſe, is, to replant them with entire roots, taken up with the earth upon them, from the out-ſide of the ground. The roots are to be replaced with cuttings, in the uſual manner; which cuttings are not in this ſituation (as they would be in the middle) ſubject to be overgrown, and kept down by the canes next to them.

CHAP. III. Of the Apparatus for preſſing the Canes, and boiling the Juice.

1. *Of the Sugar-Mills.*

The mills employed for preſſing the ſugar-cane, are compoſed of three rollers, made either of iron, or of wood covered with iron: theſe are placed upright, pretty cloſe to one another, and made to turn on pivots. The middlemoſt roller is moved by the wind, water, or by cattle; by the ſame kind of mechaniſm as the corn and other mills in Europe: the two others are turned by this, each of the three having for that purpoſe a cog and teeth at the upper end.

The canes applied endwiſe betwixt two of the rollers, are drawn through with great force, and ſqueezed quite flat: the juice, greateſt part of which is by this means preſſed out from them, is received on a board or flooring (which in our plantations is covered with ſheet lead) and thence conveyed along an inclined gutter, to the boiling houſe. The canes which come out on the oppoſite ſide of the rollers, are doubled and paſſed back again, in order to force out the remainder of the juice.

Ligon relates, that the Spaniards have a preſs, for preſſing out what juice may remain in the canes after they have twice paſſed the rollers; but the quantity thereof is too inconſiderable to compenſate this trouble. The *traſh*, or canes that have been preſſed in the mill, are dryed a little in the ſun, and employed for firing.

The great tendency of the juice to grow ſour, renders it neceſſary to frequently waſh the mill, gutters, and likewiſe the ciſtern in which the liquor is reſerved for boiling. The planters both of the Britiſh and French iſlands in general are very ſenſible of the neceſſity of being curious in this reſpect; and carefully waſh the mill and gutters twice a day.

2. *Of the Boiling-Houſe.*

Labat is very particular in his deſcription of this apartment, and its ſeveral appurtenances; and obſerves, that a due diſpoſition thereof is a point of very great importance. We ſhall give our readers the ſubſtance of his account, as it is probable the judicious Britiſh planter may find ſome advantage from the peruſal.

The general requiſites of the boiling-houſe are, that it be conveniently ſituated for the conveyance of the juice to the boilers from the mill; that it be built of ſtone or brick, particularly the wall againſt which the boilers are to ſtand; that the mouths of the furnaces be to the leeward, or defended by the building from the trade winds; and that the room itſelf be high, airy, well lighted, and have good vents for carrying off the ſteam, which ariſes in great abundance during the coction of the juice.

A room, 35 foot wide in the clear, will receive five coppers (which is the uſual number in one boiling-houſe) along the end wall. If the number of coppers is greater than five, they may be mounted more conveniently againſt one of the ſide walls; ſince otherwiſe the room muſt be of an extravagant width, each copper requiring ſeven feet. If the width is thirty-five feet, the houſe, in order to its being ſufficiently convenient for all the uſes which it is deſigned for, ought to be about fifty feet in length.

One end, to the diſtance of ſix feet from the wall, is taken up by the coppers, and the ſpace left betwixt them and the wall behind, and betwixt their rims and a low wall built before them acroſs the houſe. The part incloſed betwixt theſe two walls is called the ſlope of the boilers. Beyond this, is left a ſpace nine or ten feet wide, for a thoroughfare from one door to the other, and for room to thoſe who work at the coppers. Here alſo are placed the troughs, which the rough ſugar is ſet to cool in before it is barrelled; and the moulds, into which other ſugars are to be put as taken from the laſt boiler. All the remaining ground, to the oppoſite end of the houſe, is ſunk to the depth of five or ſix feet; and the cavity paved at the bottom, and lined on the ſides, with good ſtone or brick-work, ſo as to form a tight ciſtern. Some make their ciſterns of planks of wood framed together: theſe are let down on a bed of tempered clay; and ſome more clay rammed into a ſpace left for that purpoſe betwixt the earth and the ſides. This ciſtern is covered with joiſts, laid about ſix inches diſtant from one another, and let into timbers at each end (but not pinned, or faſtened, that they may be occaſionally got up) in ſuch a manner as to be about half a foot higher than the level of the reſt of the floor. The uſe of the joiſts is for ſetting the barrels of muſcovado on, that the melaſſes may drain from them into the ciſtern. In working for *whites*, the joiſts are covered with boards, on which are ranged the dripping pots ſuſtaining the moulds with the ſugar. Here the ſugar ought to remain but for a little while; if left for any conſiderable time in the boiling-houſe, it will be in danger of being fouled by the unctuous exhalations which continually ariſe from the coppers. Some therefore, to prevent this inconvenience, divide this part of the houſe by a partition and doors.

3. *Of the Furnaces.*

The wall where the furnaces are to be made is divided into five or more arches, according to the number of coppers. Theſe are built of free ſtone, or brick, the whole thickneſs of the wall, which they ſerve to ſupport whilſt the furnaces are fitting up or repairing; for in order to do this, the whole inſide of the arches muſt be opened.

The capacity of each furnace is ſuch as juſt to receive the boiler, which is let down to two thirds its depth. The doors of the furnace and of the aſh-hole, are each twenty inches ſquare; the thickneſs of the ſtone or brickwork betwixt them, twelve inches. In the ſide walls, at the height of eight or nine inches above the grate, and eighteen inches from the front, are made apertures four or five inches ſquare; from which, by means of flues, two or more furnaces diſcharge their ſmoke into one common chimney. Each flue is furniſhed with a regiſter, or ſquare ſtone, made to ſlide outwards and inwards, for cloſing the aperture when the flame happens to ariſe too violently. Theſe regiſters likewiſe ſerve to ſave fuel, by letting it conſume no faſter than is neceſſary to keep the coppers in a due ſtate of heat.

The

The door of the aſh-hole ſhould be at leaſt a foot higher than the level of the ground on the outſide, that the air may be admitted the more freely. In ſome boiling-houſes, where this precaution has been neglected, it has been found neceſſary to ſink pits into the ground under the furnaces: theſe, though uſeful for the above purpoſe, are inconvenient; the water lodging in them in rainy ſeaſons.

As to the materials moſt proper for building the furnaces of, bricks, when well made, are preferable to ſtones, the former being found to laſt conſiderably the longeſt. The ſides, tops, and bottoms of the doors, ſhould be each of one ſolid ſtone; the grey, ſoft, free ſtones ſhould be choſen for this purpoſe, which do not crack or fly in the fire. The door-way may be defended from being broke in putting wood into the furnace, *&c.* by means of ſome iron bars faſtened on it. In the Britiſh works, the door is made of an iron plate hung upon an iron frame, as is uſually practiſed here for ſtills and coppers. The grate is compoſed of a number of the ſame kind of ſtones ſet edgewiſe; and ſometimes of iron bars: but theſe laſt, beſides their being more expenſive, have the inconvenience of ſoon conſuming by the violent and continued heat.

4. *Of the Boilers.*

One ſet of boilers, as we have already obſerved, conſiſts uſually of five. The firſt of theſe, or that in which the cane-liquor receives the firſt coction (called *clarifier* or *clarifying copper*) is conſiderably larger than the reſt (hence named by the French *la grande*) being generally four feet in diameter, and three in height: the others are leſſened by degrees to the laſt, called the *tatch*, which is only twenty inches in diameter, and eighteen in depth. The *tatch* is made conſiderably thicker than the others, on account of its being expoſed to a ſtronger fire: it is likewiſe made of one piece of copper, whilſt the others are compoſed of a number of pieces rivetted together.

Some have made trial of iron boilers, and report that they anſwered ſufficiently well. Theſe have indeed the advantage of coming cheap, and not being apt to burn, ſo that it is not needful to fill them with water (which is indiſpenſibly neceſſary for copper ones) when the proceſs is diſcontinued: But they have likewiſe ſome conſiderable diſadvantages; particularly, that the unctuous matter of the ſugar readily ſticks to them, and is not to be got off without a great deal of trouble; and that cold liquors poured into them whilſt hot, make them crack or ſcale, inſomuch that they are altogether unfit for the purpoſes of the firſt largeſt boiler which receives the cold juice. To which may be added, that when they have once cracked, they can neither be mended again, or applied to any other uſe.

The part of the coppers which is not received into the furnace, is well coated with ſuch materials as will ſtand the fire without melting or crumbling. If any part happens to be bare, the copper will ſoon burn; which, beſides the loſs of the boiler, proves a great diſadvantage in point of time. Taking down a copper, and fitting up another, will, according to our author (whoſe account we have entirely followed in the above deſcription of the apparatus) be a hindrance of at leaſt fifteen days; the freſh mortar, *&c.* he ſays, will be twelve days in drying, before a fire can be made with any ſafety. Indeed if the furnace is made of ſtone, and if left to dry by the natural warmth of the air, ſo long a time may be neceſſary; but it may be rendered fit for working again in a much ſhorter one, by making a ſmall fire in it (which may be done without the leaſt danger) as ſoon as finiſhed; and increaſing it by degrees till the whole is dryed ſufficiently; which will be in a day or two at fartheſt. Some have been ſo expeditious in this reſpect, as to do the whole in one day; but a more leiſure drying is to be preferred, where time will admit.

The coppers are placed in ſuch a manner, that there may be an eaſy ſlope from the *clarifier* up to the *tatch*, which laſt ſtands above ſeven inches above the level of the firſt. By this diſpoſition, ſuch part of the cane-liquor as happens to riſe over in the boiling is prevented from running forward into the coppers containing a more purified juice, and carried back either into the copper it iſſued from, or into others whoſe contents are ſtill more impure.

It is likewiſe neceſſary, that the bottoms of the three laſt boilers ſtand higher above the grates of their reſpective furnaces than thoſe of the two firſt. The firſt and ſecond coppers, whoſe furnaces are the wideſt, though they require the leaſt heat, would conſume too much fewel if raiſed to any conſiderable height above the grate; whilſt the other three, which have narrower furnaces, though a greater degree of fire is neceſſary, require the deficiency in width to be compenſated by a greater height. The bottom of the *tatch* ought to be at leaſt twenty inches above its grate; that of the *clarifier* not above eighteen.

If the dimenſions of the coppers themſelves do not admit of the abovementioned elevations (as is generally the caſe) their height is increaſed at top by a round of bricks or tiles about the rims of each: For the *tatch*, hewen ſtone is preferred; in order that, the junctures being fewer, there may be leſs danger of any morter looſening, and falling into the now purified ſugar. The whole ſlope is covered with tiles. — An excellent cement for this purpoſe is prepared by mixing ſome good morter with a little cow dung, and working them extremely well together.

In ſome boiling houſes, a large cavity is made in the fore wall of the ſlope, for receiving the ſcums as they are taken off the coppers: from whence an inclined gutter conveys them to the ſtill houſe. This practice is ſcarce to be commended, as it occaſions the ſlope to be always foul. *Labat* tells us, that in the ſugar works which he had the direction of, he covered the ſlope with ſmooth ſheet lead, putting the ſcums into large tubs placed conveniently near the boilers. The ſlope thus covered, and the coppers, are very eaſily kept clean, and might be waſhed five or ſix times a day, without taking up half an hour in all. Every time a copper is emptied, a pail of water is poured into it, the copper itſelf and its edging and ſlope ſcrubbed with a broom, and the water taken out again with a ladle.

We ſhall cloſe this chapter with a contrivance which ſome of the ſugar planters are ſaid to have taken the hint of from the furnaces of our men of war, *viz.*

5. *For boiling all the Coppers with one Fire.*

This is effected by building a furnace under one of the endmoſt coppers, and conducting its heat to the others by means of a flue, which runs along underneath them. The furnace is made under the *tatch*, this requiring the greateſt degree of heat; and the chimney juſt beyond the *clarifier*, which requires the leaſt heat. It is perhaps neceſſary that this furnace be ſomewhat larger than that of the *tatch* uſually is: *Labat* propoſes the ſame height as ſufficient, but directs it to be made rather wider than the furnace of the *clarifier*, which is generally the wideſt of them all. The flue gradually diminiſhes in width from the *tatch* to the *clarifying* copper: at the firſt it is twenty inches wide; at the entrance into the chimney only fourteen. Under the four firſt coppers, inſtead of furnaces there are only cavities, having each one aperture or door in the front about a foot ſquare. The uſe of theſe is for taking out ſuch aſhes as the violence of the flame may have carried along with it. The doors ſhould be very exactly cloſed whilſt the furnace is at work, that no air may be admitted by them, or any flame ſuffered to iſſue out.

How far this contrivance has been brought to bear in the *American* iſlands, we know not; but thus much we can aver, from our own experience in other works, that it might be made by a ſkilful workman to ſucceed in great perfection, ſo as to ſave time, fire, and labour.

CHAP. IV. The Method of preparing Muſcovado or brown Sugar.

The juice of the ſugar cane contains, beſides the truly ſaccharine part, a large quantity of groſs, unctuous, and other matter; in the more or leſs perfect ſeparation of which, the goodneſs and differences of ſugars chiefly conſiſt. This ſeparation is effected by means of certain additions; which partly incorporate with the ſaccharine matter itſelf, enabling it upon due exhalation to concrete into a ſolid ſugar; and partly unite with the impurities, occaſioning them to ariſe in ſcum by the heat applied for evaporating the watery moiſture. The moſt common addition for this purpoſe is a ley drawn by water from lime and aſhes, uſually called *temper*.

1. *Of the Temper.*

The principal ingredient in this ley is quick lime; which, in order to its having the due effect, ought to be well burnt, and as ſtrong as poſſible. And herein the greater caution is required, as an increaſe of the quantity of weak or ill burnt lime will not make up for its want of ſtrength: whatever proportion of it be employed, the ſugar turns out unctuous or clammy.

As this article is of conſiderable importance, we ſhall here give a ſummary view of the reſult of a great number of experiments and obſervations made concerning it; which we apprehend will enable the preparer of this commodity to determine the moſt proper ſubjects for making it from, and the purchaſer to form ſome judgment of its good or ill quality.—It appears,

1. That all earthy or ſtony bodies, which diſſolve in acid liquors (as chalk and different ſorts of ſtones, certain productions of the ſea, uſually called ſea plants, the ſhells of eggs, of ſea fiſhes, *&c.*) afford a quick lime on being calcined or burnt with a ſtrong fire.

2. That ſhell-lime is weaker than that prepared from chalk; and this than the lime of harder ſtones.

3. That the harder, heavier, and more compact the ſtone, for the moſt part the ſtronger is the lime.

4. That of two limes, prepared from two different ſorts of ſtony ſubſtances, and equally well burnt, the heavieſt is the ſtrongeſt.

5. That of two limes prepared from the ſame kind of ſtone, the lighteſt is the ſtrongeſt.

6. That if the ſtone contains any matter not ſoluble in acid liquors, the lime will be weaker in proportion to the quantity of ſuch matter.

7. That quick lime loſes of its ſtrength by long keeping.

8. That in proportion as it loſes of its ſtrength, the lumps become crumbly and powdery.

It follows from theſe obſervations, that the French planters who prepare their lime from ſea plants and ſhells, and ſuch of ours as import ſtone lime from *England*, do not obtain therefrom all the advantage which this article, when in perfection, is capable of yielding them. It ſhould therefore ſeem worthy of inquiry whether there are not in America ſtony matters that will burn to a good lime, which, ſo far as is yet known, all thoſe that diſſolve in acids will do.

Aſhes, the other ingredient of the temper, are not always neceſſary: the particular caſes in which they are required, will appear hereafter. The aſhes of the more ſolid kinds of woods generally anſwer beſt, as containing the largeſt quantity of alcaline ſalt; and for the ſame reaſons the aſhes of almoſt all ſorts of wood are preferable to thoſe of the cane traſh, or other light vegetable matters. If the aſhes are not made uſe of ſoon after they are taken from the furnace, they ſhould be kept cloſe from the air, as they will be apt to undergo an alteration therefrom which renders them unfit for this purpoſe.

The manner of preparing the temper, and the quantity of water employed, are altogether arbitrary. The only precaution is, that the ley be ſtrong and fully ſaturated. It is ſaid that twenty pounds of good quick lime will make about thirty gallons of very ſtrong lime water. The water ſhould be ſprinkled gradually upon the lime at firſt, till the whole is fallen into powder (when the reſt may be added to it) otherwiſe a kind of muddy ſubſtance forms upon the outſide, which defends the reſt from being acted on by the water, ſo that a conſiderable part of the lime remains undiſſolved. The liquor, after ſettling, is to be decanted, or paſſed through a coarſe ſtrainer, and ſet in a cool place. It ſhould be always made freſh as wanted: for if long kept, eſpecially in a warm place, great part of what the water had taken up from the lime will ſeparate from it.

2. *Of Tempers made uſe of by the French.*

The French employ along with the lime and aſhes certain hot pungent herbs, which they ſuppoſe abſolutely neceſſary to the due purification of their ſugars. The Britiſh planters lay little ſtreſs upon additions of this kind; and indeed their uſe ſeems to be rather owing to cuſtom and prejudice, than their being any ways really ſerviceable. Neverthleſs, as our readers may be deſirous of ſome account of theſe plants, we ſhall ſubjoin that given by Labat, which is indeed ſufficiently imperfect, but the only one we have met with.

“ The plants are, 1. Corn herb (*herbe à blé:*) This is an herb which grows in tufts, like corn two or three months old: the tuft is taken up entire with the root, which is very ſmall. 2. Spearwort (*herbe à pique:*) This plant has a ſtrait ſtalk, about the thickneſs of a gooſe quill, fifteen or eighteen inches high; on the top grows a ſingle leaf, like thoſe of ſorrel, but more perfectly reſembling in ſhape the head of a ſpear. 3. The Ill-named (*la mal-nommée:*) This is a ſmall, tender, fine herb, curled like the negroes hair. 4. Burning With (*lianne brûlante:*) This is a ſort of ivy, with tenderer and thinner leaves, and more ſpongy ſtalks, than the European ivy. 5. Indian cane (*canne d'Inde, ou ſeguine bâtard:*) This grows by the ſides of waters, in boggy places: the ſtalk is round, about an inch in diameter; its ſkin very thin, and of a deep green colour; the inſide white, pretty compact, full of an extremely pungent juice, which leaves an indelible ſtain on ſuch linen or woollen cloth as it is ſuffered to fall upon: the leaf is in ſhape altogether like a beet leaf, but of a more ſmooth, ſhining, deep green colour, and almoſt without any diſtinguiſhable veins.

The three firſt of theſe herbs are taken in equal quantity, with a few leaves and pieces of ſtalks of the fourth. The whole are cut and bruiſed a little, and the bottom of the ley-tub covered therewith to the height of three inches. On this ſome wood aſhes are ſpread; and above theſe, a layer of quick lime. In this manner the workmen proceed with ſucceſſive layers of the herbs, aſhes and lime, till the tub is nearly full, ending with the herbs. The fifth plant is not employed in the bottom bed; but in each of the others one or two ſtalks of it, freed from the leaves, and cut into ſlices about the thickneſs of a crown, are mixed with the reſt of the herbs. If the aſhes were taken hot from the furnace, the tub is filled up with cold water; if the aſhes were cold, the water is poured boiling on the ingredients. The ſtrength of the ley is judged of from its ſharp corroſive taſte, and from its ſtaining the fingers yellow.” Thus far Labat.

It is not eaſy to diſcover, from the foregoing imperfect deſcriptions, what the plants employed by the French really are. We have indeed met with ſome American herbs in botanic writers, which Labat's account, ſo far as it goes, ſufficiently agrees with: But as we are not fully ſatisfied herein, and as we can ſee no good grounds for the uſe of any unburnt herbs at all, we ſhall not trouble our readers with any thing farther on this head.

“ Some of the French planters, according to the ſame author, employ in the temper for very impure juices, a quantity of powdered antimony: This drug is ſaid to excellently cleanſe ſugars, but to have the inconvenience of making the temper black, and the ſugar itſelf to turn out grey; whence its uſe is chiefly confined to muſcovado or coarſe ſugars. Alum is likewiſe frequently made uſe of when the juice proves very foul: as much alum as a pint of lime water will diſſolve, is poured into the *tatch* juſt as the inſpiſſated matter is ready to be taken out. If this does not produce the due effect, a little more alum, reduced into powder, is afterwards ſprinkled in.”

What the real effect of theſe two ingredients is, we ſhall not take upon us to determine; but obſerve, that the uſe of the firſt is unknown to our planters; and the ſecond diſapproved by them.

3. *Of the Qualities of the Cane-juice, and the different Tempers and Quantities of Temper ſuitable thereto.*

The temper, treated of in the two foregoing ſections, is by our planters added only in the firſt copper; and this in a certain determinate quantity. The French on the other hand, according to Labat's account, employ the temper only in the four laſt coppers; and determine its proportion from the effect which it produces; a little being poured in at a time, till no more ſcum ariſes upon a farther addition. For the firſt copper, they make uſe of a ſmall quantity of ley drawn by a part of the juice from quick lime and aſhes, the proportions of which are regulated according to the quality of the juice.

1. If the juice appears clear and whitiſh, with a little ſcum of the ſame colour on the top, it is judged immature and very foul. The firſt ley for this ſort of juice is made from equal parts of lime and aſhes: the quantity of each for one clarifier of the common ſize (four feet deep and three in diameter) is about as much as will fill a pint and half, Engliſh ale meaſure: this quantity is diminiſhed, and ſometimes a little increaſed, according as the juice is leſs or more impure. The ley is prepared by mixing theſe ingredients in a ladle, with ſome of the juice, which after ſtanding for a little time, till the undiſſolved part has ſettled to the bottom, is poured gently off into the reſt of the juice in the copper, and the whole well ſtirred and mixed together.

2. If the cane liquor is blackiſh and thick, and of a ſtrong ſmell inclining to ſour, the canes were greatly too old. In ſuch caſe, the juice, though more difficult to purify than ſuch as is in its moſt perfect ſtate, will be conſiderably leſs ſo than the foregoing unripe juice. Hence the lime is here diminiſhed one half, the quantity of aſhes remaining the ſame as before.

3. If the juice appears viſcous, glutinous, and of a brown colour; if in running along from the mill, it forms a grey, thick ſcum; and if its taſte is very ſweet and rich, with ſome degree as it were of an aromatic flavour; the juice in theſe circumſtances is judged to be in its greateſt perfection, loaded with ſugar, and ſufficiently eaſy to boil and clarify. Here only three quarters of a pint of aſhes, and one third that quantity of lime, are employed for the firſt ley.

There are no certain rules for the ſeveral intermediate degrees betwixt the moſt perfect ſtate and the two extremes of immaturity and over-ripeneſs. Thoſe who are converſant in the making of ſugar can eaſily judge from the taſte, or then from the appearance of the cane itſelf, both of the quality of the juice, and the ſtrength which it requires the ley to be made of.

4. If the juice is perfectly ripe, and extremely rich and thick, it is convenient, and ſometimes neceſſary, to add in each of the four laſt coppers ſome water made boiling hot. Care muſt be had, that no cold liquor be poured into boiling juice; as this would throw down the ſeparated impurities, and fix them into the directly ſaccharine part, ſo as to render the farther purification of the ſugar extremely difficult.

The four preceding obſervations we have extracted from Labat: though they are not entirely agreeable to the practice of the Britiſh planter, they may nevertheleſs poſſibly afford him ſome uſeful hints. Whether the addition of temper in the laſt coppers, as this author directs, be of any conſiderable advantage, or real prejudice to the ſugar, we ſhall not pretend to determine. In our iſlands, it is judged to be in general at leaſt unneceſſary. Some writers, particularly Piſo, affirm, that if any temper be put into the tatch, it will be impoſſible to get any ſugar from it at all: but this opinion is perhaps rather founded upon conjecture than experience.

As to the quantity of temper, the Engliſh planters do not ſeem to have any ſtandard rule. Where the juice is of a tolerable good quality, one tenth its quantity of ſtrong lime water has been found to anſwer moſt ſucceſsfully. The firſt parcel of ſugar made from a piece of canes will eaſily diſcover whether this proportion be too much or too little; and thus afford a rule for aſcertaining the proper quantity for the reſt of the piece. An exceſs or deficiency of temper may likewiſe be readily judged, by dipping a ſkimmer into the tatch when the liquor is boiled nearly to the conſiſtence of a ſyrup, giving it two or three quick twirls, and then turning the edges downwards: if the flakes which fall from it hang long, the juice was not ſufficiently tempered; if ſhort, breaking cloſe to the edge of the ſkimmer, the due proportion of temper has been hit.

When the ſugar cane is tainted by exceſſive drought, though the juice be very rich and perfectly ripe, it generally yields a coarſe foxy ſugar. The beſt method of managing theſe kinds of juices to advantage ſeems to be, to temper them high; and when boiled to the conſiſtence of a thick ſyrup, to pour into the tatch two or three gallons of water; by which the tainted matter is thrown up to the top in form of a viſcous ſcum, which muſt be carefully taken off. This method we find recommended (by the ingenious author of an *Eſſay on Planterſhip*, lately publiſhed at Antigoa) as a very effectual one for making a ſtrong bright ſugar from ſuch as is very much tainted; provided it be rich and of full maturity: but if the tainted juice be poor and watery, it cannot by any art, hitherto diſcovered, be made to afford a good ſugar. And indeed, to prepare from watery juices, though not at all tainted, a ſtrong large grained ſugar, is extremely difficult, and perhaps ſcarce at all practicable; unleſs they be previouſly concentrated by ſome ſuch means as recommended in *chap.* 2. § 6.

When the cane liquor has become conſiderably ſour, or if acids have been added, it is no longer fit for the purpoſes of the ſugar boiler. When only beginning to turn ſour, high tempering, and employing in the temper a large proportion of aſhes, will ſometimes recover it.—Perhaps a prudent addition of allum might in caſes of this kind be of ſervice.

4. *The Method of boiling and clarifying the Juice.*

This proceſs is begun by heating ſome water in the coppers; which is to be emptied out from each juſt as the juice is ready for being put in. This expedites the operation; and where all the coppers are heated by one furnace, as deſcribed at the end of the foregoing chapter, is abſolutely neceſſary to keep them from burning.

The cane-juice, ſtrained from the mill through a baſket lined with hair-cloth, is conveyed along an inclined gutter, into the firſt or clarifying copper; and a ſuitable quantity of temper immediately added. A moderate heat throws up a ſcum to the top; which is in greater or leſs quantity, according as the liquor is more or leſs impure, or diſpoſed to part with its impurities. When the ſcum appears to have quite covered the ſurface, it is taken off as quick as poſſible, with care not to ſtir the liquor underneath. After this, the ſcumming is continued, and the liquor kept gently boiling for about an hour; when it is emptied into the next copper, with care to prevent the bottom of the firſt from burning, and to ſupply it aſſoon as empty with freſh juice.

The juice is uſually ſtrained into the ſecond copper, through a woollen blanket placed in a wooden box bored full of holes; which box is ſupported by two poles laid over the copper. The liquor runs at firſt pretty freely; but by the time half of it has gone through, exceeding ſlowly; eſpecially if the juice was naturally foul. In ſuch caſe, the French ſtrain it firſt through a coarſe cloth, which retains the groſſer impurities, and afterwards from the ſecond copper into the third, through the blanket, which it now paſſes more readily. The common French muſcovado is not ſtrained at all: the ſtrained ſort they call *ſucre paſſee*, or *caſſonade griſe*: they firſt learnt this practice from the Engliſh, about the year 1700.—The ſtrainers muſt be well waſhed after each time of uſing; with care that they be not expoſed in drying to the unctuous ſteams of the coppers: nor ought they to be dryed by a fire; as this would ſcorch or ſhrink up the nap of the cloth, which is the principal thing neceſſary for detaining the impurities of the ſugar.

The liquor in the ſecond copper throws up more of its impurities, which are ſkimmed off as in the firſt; and the coction and deſpumation continued till the juice in the firſt boiler is ready to replace this; when this ſecond is emptied into the ſucceeding one, with the ſame cautions as before. And in this manner the liquor is paſſed through all the five coppers, and ſometimes more. A number of coppers is matter not of neceſſity, but convenience; as it occaſions a much greater diſpatch; and the ſugar itſelf likewiſe to be purer, than it could be if boiled down to its proper thickneſs in the firſt large copper which the impure juice was clarified in.

The liquor is kept boiling very ſlowly till ſuch time as it appears to be ſufficiently clarified; after which it is made to boil as faſt as poſſible, and continually *keeled* or drawn up with a ladle. If boiled quick before clarification, or too ſlow after it, the ſugar would turn out unctuous or clammy. In the laſt copper, the matter becoming very thick and tenacious, is apt to ſwell ſuddenly and boil over: this is prevented by throwing in a little butter, fat, oil, or the like. (If theſe ſhould be imprudently added in the firſt copper, it is ſaid by Piſo, that the liquor would be irrecoverably ſpoiled.) The thick ſyrup is continued in ſtrong coction, *keeled*, and ſkimmed occaſionally, till it is judged to be boiled ſufficiently.

A good deal of ſkill is neceſſary for exactly aſcertaining this point; and an exceſs or deficiency herein are equally of ill conſequence. If boiled too much, the melaſſes will not ſeparate from the grain, or the ſugar come white; if too little, the grain not being duly formed, will run off along with the melaſſes, and thus occaſion a very notable loſs.

The term of compleat boiling is uſually judged from the thickneſs of the matter, its degree of tenacity betwixt the fingers, its weight when drawn up with the ladle or ſkimmer, and its forming a number of ſmall pearl-like bubbles on the back of the ladle.—All theſe marks are deceitful, particularly the laſt:

a little more or leſs butter or oil, thrown into the tatch, will alter the whole appearance.—The degree of tenacity is ſomewhat more to be depended on. A ſtick is dipped into the tatch, and ſo much of the ſugar taken off upon the thumb, as will draw out into a ſtring, and no more: the fore-finger is then applied on the thumb; and the liquid ſugar drawn out into a thread betwixt them, at the inſtant the intenſe heat is going off. The thread breaks at different lengths below the finger, according to the degree of boiling: if three inches, the ſugar is ſaid to be *piece-height*, and ſuppoſed of the moſt proper conſiſtence for the large or nine-gallon moulds; if one inch, *lump-height*, ſuited for moulds of half the former ſize; if leſs than half an inch, *loaf-height*, ſuitable for the ſmalleſt moulds, and for the muſcovado pots or barrels. This method of judging the degree of boiling is called *taking proof*.—Mr. Ligon (in his hiſtory of Barbadoes) mentions a mark of the evaporation being carried to a ſufficient length, which ſeems to be rather more certain than any of the foregoing, *viz.* that a few drops, on being removed into a cold place, ſuddenly candy and grow hard.

Aſſoon as the liquid ſugar has given this mark of its being diſpoſed to grain, it is emptied into wooden troughs or coolers, and ſuffered to ſtand till the ſurface appears covered with a well formed ſaccharine cruſt. This cruſt is broken, and well ſtirred in with the more fluid part; by which means the ſugar, that ſtill remains diſſolved, is enabled the more readily to concrete. The whole is then removed into other coolers; and after being again well ſtirred, ſuffered to reſt till grown cool enough to be endured by the hand without pain. The matter is then put into pots or barrels, having holes in the bottom for allowing the liquid part or melaſſes to drain off into the ciſtern.

The muſcovado cured in pots (as in Jamaica) is ſmaller grained than ſuch as is cured in barrels: if this be deemed any diſadvantage, it may be prevented by cooling the ſugar quickly in broad ſhallow veſſels, till ſuch time as it is but juſt liquid enough to be poured into the pots. It appears in general, that the more haſtily it is cooled, the larger the grain; but we apprehend that the ſugar will be proportionably the leſs pure.

5. *Of ſome Frauds practiſed with regard to Muſcovado in the* French *Sugar-works*.

Theſe we ſhall give our readers on the authority of a French writer already often quoted, Labat.— Some planters add to their ſugars an earthy ſubſtance known by the names of *gypſum*, *alabaſter*, or *plaſter of Paris*: this they throw into the tatch in the quantity of ſixteen ounces or more. The effect of this addition is to unite the melaſſes with the ſugar, and occaſion almoſt the whole to concrete into a compact bright maſs, of a large, hard, and weighty grain. This ſort of ſugar appears extremely beautiful to the eye; but is nevertheleſs of a very bad quality, and will ſcarce at all bear refining. If a little of it be moiſtened with warm water, it will manifeſtly appear to ſeparate into a ſaccharine ſubſtance, and a black unctuous liquor, which is the melaſſes that the plaſter had as it were congealed in it. The great weight of this kind of ſugar, the brightneſs of its grain, and the perceptible ſmell of burnt melaſſes, which it is always accompanied with, ſufficiently diſtinguiſh it from ſugars that have not ſuffered abuſe.

Others are accuſtomed to throw into the cooler, aſſoon as the tatch is emptied, a ladle or two of cold melaſſes from the ciſtern. This readily congeals the ſugar in the cooler, and unites with it into a hard weighty maſs, of a ſufficiently dry and grained appearance, but which in a ſhort time grows ſoft, and runs into an impure treacly liquid. This ſort of ſugar is eaſily diſtinguiſhed by the burnt melaſſes ſmell, which manifeſtly prevails in it.

The groſſer abuſes, of filling the barrels at different times, that the ſugar put in at firſt may retain the melaſſes of the reſt, *&c.* we forbear to ſpeak of.—The beſt method of converting this coarſe melaſſes to real advantage with regard to the making of ſugar, we ſhall have an opportunity of ſpeaking of hereafter, under the head of *melaſſes ſugars*.

CHAP. V. The Method of making clayed Sugars.

1. *Of boiling the Juice*, &c.

The proceſs of *boiling* and *clarifying* the cane-liquor for clayed ſugars or *whites*, is nearly the ſame as for muſcovado; excepting that here the purification is required to be more perfect, and the whole operation to be conducted with the utmoſt care and cleanlineſs.

The *degree* of boiling is likewiſe determined in the ſame manner; with only this difference, that the juice ſhould not be boiled quite ſo low for whites, as is cuſtomary for muſcovado; eſpecially if the canes were in ſuch perfection, as for making good white ſugar they ought to be. The juice of green canes, for any kind of ſugar, requires ſomewhat more boiling than that of full ripe ones.

The inſpiſſated juice is *cooled* more ſlowly than for muſcovado, in deep wooden or copper veſſels. This occaſions the grain to be ſmaller; which is an advantage to the colour of clayed ſugars. The ſugar is well ſtirred in the coolers; and, whilſt it ſtill remains liquid, poured into the moulds.

2. *Of the Moulds and Drips.*

The moulds are conical earthen pots, having in the narrow end or head a hole ſufficient to admit the little finger. They are of different ſizes, from a foot and a half to three feet in height, and from twelve to ſixteen inches diameter at the mouth: round each end is a ring of the ſame earth which the reſt of the veſſel is made of. The moulds muſt be well hooped or bound with withs, to prevent their cracking from the heat and weight of the ſugar; and ſoaked in fair water for fifteen or twenty hours before every time of uſing. New moulds, previous to the ſteeping in water, ſhould be ſeaſoned for two or three days in the liquors which are fermenting for ſpirit: the ſtrong ſmell which they contract from theſe liquors eaſily comes off by the water. By this preparation, the empty pores of the veſſel are filled, which otherwiſe would imbibe part of the ſugar, and thus prevent the loaf from coming out entire.

Three, four, or more of the moulds thus prepared, are ranged before the ſlope of the coppers; each ſtanding upon an earthen pot, called a *drip*; the hole in the narrow end (which is lowermoſt, and fitted into the mouth of the pot) being ſtopped with a wad of linen, or the like. The drips ſhould be ſeaſoned after the ſame manner as the moulds, and likewiſe hooped about the necks, which will not only prevent their breaking when loaded with a mould full of ſugar, but alſo make them laſt much longer than otherwiſe.

3. *The Method of preparing Sugar in the Moulds.*

The ſyrup, after having been well ſtirred and mixed in the cooler, is emptied into the moulds by means of a two-handled ladle; obſerving to pour part of each ladle full into each of the moulds, and to pour the firſt of one ladle full into that mould which received the laſt of the foregoing ladle; by this means the grain and melaſſes are equally diſtributed.

After ſtanding about a quarter of an hour, a ſaccharine cruſt appears on the ſurface; which muſt be well broken,and mixed with the reſt, not only for promoting the formation,and equal diſtribution of the grain (as in the coolers) but likewiſe in order to enable the unctuous part of the ſyrup to ariſe and be collected on the ſurface, from whence it may afterwards be eaſily taken off. At the ſame time, the matter which incruſtates to the ſides of the mould, muſt be carefully ſcraped off with a knife or ſlice: if this was left adhering to the mould, the loaf could not eaſily be got out whole, and would likewiſe be ſubject to be ſtained with the colour of the earth which the mould is made of.

The ſtirring and clearing the inſide of the mould ſhould be repeated about half an hour after, but not oftner; a third repetition would too much divide and bruiſe the grain of the ſugar. The moulds are ſuffered to remain untouched, after the laſt ſtirring, for fourteen or fifteen hours; when the ſugar is found concreted into one maſs, which upon unſtopping the bottoms of the moulds ſlowly parts with its melaſſes.

4. *Of curing the Sugar.*

To expedite this diſcharge of melaſſes, which without ſome aſſiſtance from art would not be compleated in leſs than a month, *Labat* and others direct a wooden or iron ſpike to be thruſt into the ſugar from the bottom to near the top; the ſpike being wetted with water, in order to moiſten ſuch part of the ſugar as it touches. The ſugar thus moiſtened will indeed ſoon purge itſelf of its melaſſes, which will drip down the hole made by the ſpike: but as this inſtrument preſſes the ſugar towards the ſides of the mould, it is evident that the paſſage of the melaſſes from thoſe parts muſt be retarded, if not entirely ſtopt up by it. Our planters ſeem to be ſufficiently ſenſible of this; and hence have for ſome time paſt employed not a ſpike, but an augur, which cuts its way without preſſing; and by this ſimple alteration their ſugars are for the moſt part ſufficiently purged in a week.

The moulds, after being unſtopped, are kept to drain for ſome time in the boiling-houſe; but care muſt be had that they be not ſuffered to remain here too long, as the ſugar will be apt to be fouled, by the impure ſteams of the coppers. And for this reaſon the curing-houſe, which the moulds are next removed to, ought to be at a conſiderable diſtance from the boiling-houſe.

5. *The Curing-Houſe.*

The principal requiſites of the curing-houſe are, that it be well lighted, yet ſo as to admit but little air: the free acceſs of a dry air would here be oftentimes prejudicial; ſome degree of moiſture being abſolutely neceſſary to the ſugar, during great part of the time which it remains in this apartment. If there are two ſtories, the boards which form the floor betwixt them ſhould be very cloſely joined; leſt, if any of the pots ſhould happen to break or overturn in the upper ſtory, the melaſſes ſhould run down, and ſpoil the ſugar in the lower: the more effectually to prevent any accidents of this kind, it would be proper to have all the joints pitched.

Labat obſerves, that the curing-houſes in the French iſlands are generally too long in proportion to their breadth. The moſt proper dimenſions, he ſays, are twenty-eight feet in width, and one hundred and twenty in length: a building of this ſize will hold conveniently ſeventeen or eighteen hundred moulds, on one floor. The moulds are diſpoſed in rows, contiguous to one another, a paſſage being left betwixt every ſix rows; the width of which paſſage is little more than the diameter of one of the moulds.

It is convenient to have a copper or two mounted at one of the ends of the curing-houſe, for clarifying the fine ſyrups, *&c.* without the trouble of carrying them back to the boiling-houſe. It is alſo convenient to have a ſhed at the other end, for the backs or troughs in which the clay uſed for covering the ſugars is moiſtened, and for thoſe in which the ſugar is pounded after having been clayed and dryed; and a covered way from thence to the ſtove or drying houſe.

6. *Preparation of the Sugar for receiving the Clay.*

When as many moulds have been ſufficiently cured, or purged from their melaſſes, as will fill one ſtove (which uſually holds five or ſix hundred) the ſugar is knocked out of the moulds, by inverting them upon a cloth ſpread on the floor; in order that the good or ill quality of the ſugar may be judged of, and the more impure parts taken away.

On the top, or broad part of each loaf is found, a rough, uneven cruſt, which appears to be compoſed of pieces of the two firſt cruſts that were broken and ſtirred in with the liquid part, whilſt the ſugar was cooling. Beneath this is an empty ſpace, of the depth of an inch, and ſometimes more: under which is another cruſt, of a dark brown, or blackiſh colour, about an inch thick in the middle, but thinner towards the ſides. The upper cruſt, which is dry, and of an amber colour, is taken off to be refined apart: the other is moiſt and clammy, and generally ſo foul as to require being clarified afreſh. Sometimes the bottom of the loaf proves likewiſe yellow, and very unctuous; and the body of it full of reddiſh or blackiſh ſpots inclining to yellow: in ſuch caſe the ſugar is aſſuredly fat, and ill made; and will not come white without a repetition of the proceſs by which the cane juice was clarified at firſt. If the loaf appears of a fine pearl colour, or rather clearer, cloſe and well united all along the ſides, and if the bottom be pretty dry and ſhining, the ſugar may be judged of a ſufficiently good quality, and promiſes to whiten well.

The loaves (freed from the cruſts, and likewiſe from any unctuous or impure matter, which may appear upon raking up the ſurface to the depth of an inch or two) are returned into the moulds, which are ranged in their places again, and filled up to within an inch of the top with ſome of the ſame ſort of ſugar reduced to powder. Seven or eight, and ſometimes ten moulds are neceſſary for filling up the others. The powder is preſſed or ſmoothed down with a circular piece of iron or copper made for this uſe; that the ſurface may be cloſe, ſolid, and exactly level. If one part is ſuffered to be leſs compact, or lower than the reſt, the moiſture of the clay will act chiefly on that part, and make a hole therein, without having its due effect on the others.

7. *Of the Clay.*

The choice of a proper clayey earth is of conſiderable importance to the ſucceſs of this operation. Coloured clays, or ſuch as give any tinge to watry liquors, are evidently unfit for this uſe; as the water coming from them coloured, would foul the ſugar. Strong fat earths, which do not part with the moiſture they have imbibed, or which ſend it up to the ſurface (as many of the more viſcid clays do) are no leſs unfit. The very lean and ſandy clays are likewiſe improper, as letting their water run off too haſtily; theſe have alſo an inconvenience of imbibing ſome part of the unctuous matter of the ſugar, and conſequently in a little time becoming too foul for further uſe. The clays that have been found to anſwer beſt, are of a pretty white colour, very ſmooth and ſoft, without any ſenſible admixture of ſtones, ſand, or grit, and juſt tenacious enough to hold together.

The French planters are very curious in the choice of their clay; they generally employ a fine bolar earth, brought from *Roüen*, which Labat ſays he has ſeen ſold, in times of war, for no leſs than thirty crowns a barrel. The fraudulent dealers ſubſtituted to this commodity certain other earths, mixed with chalk, to give them the white hue which the true *Roüen* earth was valued for. "Abuſes of this kind (ſays the author abovementioned) are not eaſily diſcovered till the earth comes to be made uſe of, when the diſcovery is too late. Neceſſity, the mother of invention, has taught me ſome ready ways of diſtinguiſhing the genuine from the counterfeit. Some of the true *Roüen*, and of the counterfeit ſort, were mixt ſeparately with water; and after ſtanding to ſettle, the water was carefully poured off, and the remaining earths ſuffered to dry. The genuine retained its colour perfect, and its weight almoſt entire; whilſt the counterfeit had loſt conſiderably of its weight, and was likewiſe of a much duller colour, the chalk being waſhed off by the water, and leaving the clay of its natural hue." Theſe experiments may poſſibly have their uſe; but we think the intention of them might be anſwered with much greater certainty by acid liquors; which will diſſolve chalk and all the marly earths, but have no effect upon pure clayey ones.

8. *Preparation of the Clay, and the Method of claying the Sugar.*

The clay is prepared for uſe by ſoaking it in water, which is renewed every day, and the clay well ſtirred and mixed with it each time; this is continued eight or ten days, or longer, till the water comes off perfectly clear and colourleſs. The ciſtern or trough, in which this operation is performed, ſhould be well ſheltered from the ſun, as the water would otherwiſe be apt to run into a kind of fermentative ſtate, which would ſpoil the clay. After the water has been drawn off for the laſt time, the ſoft clay or *batter* is paſſed through a copper veſſel full of ſmall holes, in order to ſeparate any ſmall ſtones that may be in it, and ſuch parts of the clay as are not ſufficiently diſſolved; and afterwards carried in pails to the curing-houſe.

The conſiſtence of the batter ought in general to be ſuch, that a hole made therein with the finger ſhall by degrees fill up. High-boiled ſugars (which are known by the cruſt on the top of the loaf breaking near the centre) require the batter to be thinner than ſuch as have not been boiled ſo much. If the batter for theſe laſt (where the cruſt breaks near the edge) be thin, a conſiderable part of the ſugar will be diſſolved, and run off along with the melaſſes.

The moulds charged with ſugar, as in § 6, are left expoſed to the air for three or four days, that the ſurface may grow dry, and ſomewhat hard. The vacant ſpace in the upper part of the moulds is then filled up with batter, by means of a ſmall copper ladle. If the clay was of a good kind and duly prepared, it does not throw up any bubbles, or emit any perceivable ſmell when ſpread upon the ſugar: either of theſe is a certain mark that the earth is heated and turned ſour, and indicates great danger of its ſpoiling the ſugar.

As ſoon as the moulds have been filled up with the clay, the windows of the curing-houſe are cloſed, ſo as to exclude as much as poſſible the dry air. For three or four hours, the whole muſt be narrowly watched, leſt (if the ſurface of the ſugar has not been made equally compact or even, or the moulds themſelves not placed level) the water of the clay ſhould all be determined to one part, ſo as to make a hole quite through the loaf. A little hollowneſs appearing in the ſurface of the clay, over the part, gives early notice of this accident. The remedy is, according to Labat, to ſprinkle ſome fine dry ſand into the hollow, and all round it: this, he ſays, will inſtantly imbibe and abſorb the water which was taking its courſe that way. Some of the ſame clay which the batter was made of, kept dry and in powder, would probably anſwer better than ſand.

When the batter has parted with all its moiſture (which is generally in nine or ten days) it is taken off; and, if wanted to be uſed for the like purpoſe a ſecond time, prepared by ſteeping in water as before; being firſt perfectly dryed, in a ſhady place, with the ſide that was next the ſugar uppermoſt: the very lean clays require all this part to be taken off.

9. *Of ſecond claying.*

The duſty remains of the clay being bruſhed off from the ſurface of the loaves, diſcover the ſugar of as great a degree of whiteneſs as this proceſs is capable of bringing it to. Some are of opinion, that a ſecond claying ſtill farther improves the colour; but this does not appear to be the caſe. A ſecond claying is indeed neceſſary to entirely expell the melaſſes, which by the firſt have been only carried down to the lower parts of the mould, but can have no effect on the upper part, which has been already purged by the firſt operation from all the treacly matter, that is not too intimately incorporated with it, to be ſeparated merely by a proceſs of this kind.

If the ſugar is well-made, and of a good quality, two clayings will be ſufficient to whiten the loaf almoſt from end to end. Where this does not happen, the foul part of the bottom is cut off, and farther purified, along with the cruſts, *&c.* of an inferior ſort of ſugar called *peneles* or *paneel* ſugar. The French ſometimes attempt to whiten the lower end of the loaf by moiſtening the clay afreſh after it has become dry; this they call *plumoter le ſucre.* But this practice is not to be commended: if the bottom is whitened by it, a larger quantity of the top will be diſſolved and run to waſte.

When the ſecond batter has become dry, it is taken off, the ſurface of the ſugar well bruſhed, and the upper part of the mould ſcraped clean with a knife, that none of the clay may remain, to foul the ſugar as it comes out. The windows of the curing-houſe are then opened, to promote the exſiccation of the loaves.

10. *The Stove.*

After this they are removed into a ſtove, for holding ſix or ſeven hundred moulds, which ought to be twelve foot ſquare in the clear. The door way ſhould be ſix foot high, two feet or a little more in width, and furniſhed with a double door, one opening inwards, the other outwards, the better to keep in the heat. An aperture is made in the top, fitted with a valve to be occaſionally opened for ſuffering the moiſt vapours collected from the ſugar to paſs out. The height of the room is divided into ſix ſtages (three in the height of the door, and three above it) by means of timbers reaching from the front to the back wall: the timbers which form each ſtage are about four foot diſtance from one another; on theſe are nailed a number of ſmooth ſtrong laths, for ſupporting the ſugar. This apartment is heated by an iron ſtove, fixed about the middle of the wall oppoſite to the door: its length is twenty-eight or thirty inches; the height, twenty-four; the width, twenty or twenty-two; the thickneſs of the iron two inches. This furnace has two of its ſides open; the back, which is ſupplied by the wall; and the bottom, which reſts on the grate: the aſh-hole and lower part of the iron are incloſed in ſtone or brick-work, to prevent any ſmoak from coming out into the room.

The ſtove is well dryed and warmed before the ſugar is put in; after which a gentle fire is kept up for the two firſt days: it is then raiſed ſo as to make the furnace red hot, and continued in this degree till the ſugar is perfectly dry; which generally requires eight days and nights.

The ſugar, thus dryed, is pounded in large troughs, paſſed through a ſieve, and packed up in barrels for exportation. The more perfectly it is dryed, the better does it bear carriage and keeping; and the finer it is pounded, the whiter it appears. Labat relates, that he has frequently found raſping the loaves to be more advantageous than pounding them; that it greatly improves their whiteneſs and beauty; and that the ſame ſugar which, when pounded in the common manner, was valued only at ſeventeen francs *per cwt.* fetched, when raſped, twenty-three.

CHAP. VI. The Method of peparing Sugar from Melaſſes and Scums.

1. *Of Melaſſes Sugars.*

Melaſſes contains, beſides its groſs unctuous part, a truly ſaccharine one: hence at the bottoms of the reſervoirs which it is kept in, a conſiderable quantity of concrete ſugar is uſually met with. There are three ſorts of this liquid, differing from one another in degree of purity: The moſt impure is that which runs from the muſcovado, and is received in the ciſtern of the boiling-houſe: ſuch as drips from the moulds before claying is conſiderably purer; and that diſcharged after the clay has been laid on, the pureſt of all.

1. The melaſſes of muſcovado ſugar has been generally either applied to the purpoſes of fermentation, or exported into Europe. About the year 1698, ſome German artiſts, in the ſervice of the French, found means of employing it to greater advantage, by making it into ſugar. They clarified it well with lime water; and when duly boiled, poured it into caſks furniſhed with taps in the bottom. After having ſtood to purge for fifteen or twenty days, ſome moiſtened clay was ſpread on the ſurface, to the height of ſix inches: when the clay had parted with its moiſture, it was taken off, and the ſugar dryed.

The ſugar thus prepared, though ſufficiently beautiful to the eye, has a very perceptible melaſſes ſmell, runs greatly to waſte on being re-diſſolved, and conſequently is altogether unfit for the purpoſes of the refiner. Nevertheleſs, if a conſiderable quantity of it be properly mixed with ſugar prepared in the common manner from the juice of the canes, it is ſaid not in any reſpect to injure the qualities of the latter. Labat aſſerts, that a mould may be ſafely put into one tatch; and that he has found from repeated experience that this mixture does not loſe any more in being refined, than if the melaſſes ſugar had not been added; and that by this management the planter obtains from his melaſſes the greateſt poſſible advantage, without any impoſition, or injury to the buyer.

2. The melaſſes which runs from the moulds immediately upon opening them, before they have received the clay, is conſiderably purer than the foregoing. In the French iſlands, this ſort is uſually boiled and clarified for ſugar every Monday morning, after the moulds have been carried into the curing-houſe, in a copper mounted on purpoſe for this uſe. The copper is half filled with the melaſſes, and a large quantity of lime water added. Ley alſo is here a very uſeful addition, excellently cleanſing the ſugar, and rendering it very white. Ley indeed gives a little more trouble to the boiler than lime water alone, it occaſioning the matter to ſwell up, ſo as to require being very diligently ſcummed, and frequently drawn up and keeled, to prevent its riſing over the copper: but this trouble is ſufficiently compenſated by the greater beauty of the ſugar. This ſort of ſugar is ſometimes clayed by itſelf, and ſometimes diſſolved and purified a ſecond time along with the cruſts and foul ends of the loaves.

3. The melaſſes which drips from the moulds after claying is the pureſt of all, and affords the fineſt ſugar: it is clarified after the ſame manner as the preceding. The matter boiled to the due conſiſtence, is emptied into a number

of coolers; the more coolers, the more ſure you will be of ſucceſs, for this ſort of ſugar in particular requires to be cooled haſtily: cooled ſlowly, it remains ſoft and clammy, and never gains a body. Two large copper pans are judged ſufficient for one tatch of the common ſize. Some white ſugar, well dried and powdered, is ſprinkled on the bottoms of the pans, and the clarified melaſſes well ſtirred and mixed therewith, that the powdered ſugar may be duly incorporated with the liquid, ſo as to aſſiſt its concretion, and enlarge its grain. Some more powdered ſugar is ſprinkled on the ſurface, which farther promotes the ſame effect. The coolers being then ſuffered to remain quiet, a cruſt forms on the top, which by degrees grows thicker and thicker.

When a ſecond copper of melaſſes is ready, it may, in want of coolers, be emptied into the two firſt, a piece of cruſt being for this purpoſe cut out, and the remainder looſened about the ſides, that the cruſt may riſe up as the freſh melaſſes is poured in. When the whole has grown ſufficiently cold, the cruſts are broken, the matter well ſtirred, and emptied with two-handled ladles into the moulds, obſerving to diſtribute the pieces of cruſts as equally as poſſible among all the moulds, as mentioned in the foregoing chapter. When the ſugar has concreted in the moulds, it is cured, and clayed after the ſame manner as other ſugars.

4. Some have prepared a ſugar from the melaſſes produced from theſe melaſſes, by clarifying and boiling, and afterwards claying the ſugar in barrels, after the manner mentioned above for the firſt ſort of melaſſes ſugar. The ſugar thus obtained is of a very bad quality: a portion of it, mixed with other ſugars, gives them a ſtrong burnt ſmell, and a remarkably bitter taſte. This ſort of melaſſes therefore ſhould be applied only to the purpoſes of fermentation.

2. *Of Scum Sugars.*

The ſcummings of the three firſt coppers, which are extremely foul, are always carried to the ſtill-houſe; thoſe of the two laſt are ſometimes employed for making ſugar. They are boiled in the melaſſes copper, with the addition of one fourth their quantity of water, which retards the coction, ſo as to allow time for their purging. When they begin to boil, ſome of the common temper is thrown in, and the liquor carefully ſkimmed: when nearly boiled enough, lime water and allum are added; and when the tatch is juſt ready to be drawn, ſome powdered allum is ſprinkled in. It is exceedingly difficult to perfectly purify or whiten theſe ſcum ſugars; and when they do come white, they prove greatly inferior in quality to thoſe prepared directly from the juice of the canes.

Such are the practices of the French iſlands. In ours all the ſcums are employed for fermentation; the melaſſes likewiſe are either applied to the ſame uſe, or exported as ſuch into Europe. The ſugar obtained from them, though equal or ſuperior in beauty to thoſe prepared directly from the cane liquor, is certainly inferior to them in quality: it loſes much more in being refined, and has always more or leſs of a burnt melaſſes ſmell.

CHAP. VII.

CHAP. VII. Of the Refining of Sugars.

The ſugars obtained by the proceſſes deſcribed in the three foregoing chapters, contain ſtill a conſiderable quantity of treacly matter, from which they are farther purified by the refiner.

For this purpoſe the ſugar is diſſolved in an equal weight of lime water, and the ſolution boiled and ſkimmed as long as any ſcum continues to ariſe; after which it is ſtrained through a cloth, and farther clarified by means of eggs. For a copper of four feet diameter, and two feet and an half deep, a dozen eggs, ſhells and all, are beat up with ſome lime water into a froth, which is to be thrown into the copper at different times, and well ſtirred and mixed with the liquor. The effect of this addition is to collect and throw up to the ſurface ſuch impurities as were not ſeparable by boiling with lime water alone. When a freſh addition of eggs raiſes no farther ſcum, the ſugar is emptied into one or more leſſer coppers, and boiled down with a quick fire to the conſiſtence proper for diſpoſing it to concrete.

The liquid matter is then emptied into coolers, the bottoms of which are covered half a finger's thickneſs with fine white ſugar, dryed and pulverized: ſome more of the ſame ſugar is likewiſe ſprinkled on the ſurface, to promote the graining of the liquid part, and the formation of a cruſt on the ſurface. When a ſecond tatch is ready for being drawn, the cruſt is looſened all round the ſides, and a piece of five or ſix inches diameter cut out of it: the ſyrup from the tatch is poured into this hole, with two-handled ladles, and diſtributed equally in the different coolers. When the laſt tatch has been drawn, the cruſt on the ſurface is broke, the whole well ſtirred together, and afterwards put into moulds which have been previouſly ſteeped in water for four and twenty hours. When the ſugar has concreted, the moulds are tipped, and the loaves cured and clayed after the manner already deſcribed for the making of clayed ſugars.

By repeating the foregoing proceſs a number of times, the ſugar, more and more freed from its melaſſes, becomes more and more white, hard, weighty and tranſparent; but loſes proportionably of its ſweetneſs, and the ſoft honey or violet ſmell which the plain clayed ſugars diſcover upon being rubbed or warmed a little. By often repeated purifications, ſugar may be rendered as white as ſnow, and of a hardneſs approaching to that of marble: but it has then ſcarce any ſweetneſs, proving only ſlightly pungent on the tongue.

2. *Of Sugar Royal.*

This is prepared from refined ſugar, diſſolved in weak lime water, with the addition of a ſmall quantity of allum water to improve the colour. The ſolution is clarified thrice, and ſtrained as often through a cloſe cloth. When put into the moulds, and duly purged in the common manner, ſome round pieces of white cloth, well waſhed and imbibed with pure water, are laid on the ſurface to the thickneſs of an inch and an half; and renewed every day for eight days. The ſugar being now carefully dryed, proves very weighty, of a hard, compact texture, a ſhining ſnowy whiteneſs, and ſo tranſparent that common print may be read through the thickeſt part of a large loaf.

This ſort of ſugar may be ſcented with different flowers, by ſtrewing the flowers on the moiſt cloths, and renewing them as often as the cloths are changed, and twice a day beſides: the water, filtering through the cloth, carries down with it thoſe particles of the flowers in which their fragrance reſides, and leaves them in the ſugar.

Labat relates, that twelve hundred pounds of refined ſugar yield only five hundred and forty-ſix of ſugar royal.

The French prepare, in imitation of the *royal*, a ſort of ſugar which they call *ſucre tappe*. This is no other than the common clayed ſugar raſped very fine before drying, and rammed into ſmall moulds which have been previouſly moiſtened with water. This ſort of ſugar looks very beautiful: but as its particles have no natural union, they ſeparate upon the leaſt moiſture, and run into melaſſes.

3. *Of Sugar-Candy.*

Sugar-candy is made from the muſcavado or clayed ſugars, by diſſolving them in weak lime water, and after due clarification ſetting them to cryſtalize or ſhoot in a hot room. The moulds are furniſhed with a number of ſmall ſticks laid acroſs for the ſugar to ſhoot upon: their lower aperture is almoſt cloſed, ſo as to ſuffer the part which remains liquid to filter through very ſlowly. When the ſugar is ſufficiently boiled, it is carried with all poſſible expedition into an hot ſtove, immediately poured into the moulds, and the ſtove kept ſtrongly heated. The ſugar concretes upon the ſticks into cryſtaline maſſes, of a white or brown colour, according as the ſugar was pure or impure.

APPENDIX.

The Art of fermenting and diſtilling Melaſſes, &c. for RUM, or inflammable Spirit.

1. *Of the Fermentation of the Cane Juice in general.*

All kinds of ſweet vegetable juices are capable of being converted, by means of ſlow fermentation, into vinous liquors, which may either be preſerved in that form, or made to yield by diſtillation an inflammable ſpirit; by a haſty fermentation, or a ſlow one long continued, they are changed into vinegars. The native juice of the ſugar cane, as it is eminently ſweet, is likewiſe in a particular manner diſpoſed to ferment; but without a great deal of addreſs runs, beyond the proceſs of vinous fermentation, into an acetous ſtate. After it has undergone a degree of fire, it becomes leſs ſuſceptible of theſe changes; and does not ferment readily without the aſſiſtance of ſuch matters as promote this operation: ſuch is the flower or head which ariſes upon liquors during fermentation, &c.

Here it may not be improper to hint to our readers, that the cane-juice, previouſly clarified after the manner practiſed for making ſugar, has been ſo managed as to afford vinous liquors little inferior to many of thoſe prepared from the juice of the grape, and capable of being artificially coloured and flavoured ſo as very nearly to reſemble them. The peculiar flavour admired even in the more celebrated grape-wines appears to be adventitious; and probably their different body, richneſs, ſtrength, and taſte, depend more upon the management of the artiſt, than upon any differencies in the ſubjects which they are obtained from.

2. *The Method of fermenting Melaſſes*, &c. *for Diſtillation.*

For the purpoſes of diſtillation, the coarſe melaſſes, ſcummings of the coppers, and other refuſe matters of the ſugar-houſe, are diluted with a proper quantity of water, and fermented together. The apartment deſigned for this operation is built contiguous or near to the boiling-houſe, for the greater convenience of conveying the ſubject matters thither, either in pails, or along an inclined gutter.

The fermentation is uſually performed in large caſks, ſecured with iron hoops. Some of the French planters, as Labat informs us, have ſtone ciſterns built for this uſe; others long troughs, cut out of ſingle pieces of wood. Wooden veſſels are in general preferred, as imbibing a part of the fermenting liquor, which expedites the fermentation of ſuch as is afterwards put into them. Ciſterns made of planks, well joined together, would anſwer as well as any other kind of veſſel, and be more convenient and leſs expenſive than moſt.

The liquor for fermentation is compoſed, in the French iſlands, of a mixture of melaſſes and ſcums, lowered with twice or thrice its quantity of common water: in ours, the waſhing of the coppers are advantageouſly employed inſtead of water. Equal parts of the waſhings, ſcums, and lees of ſtill bottoms (of which hereafter) are mingled together; and ſix gallons of melaſſes added to every hundred gallons of this mixture. The addition of melaſſes is made at two different times; the firſt three gallons as ſoon as the fermentation has ariſen to ſome heighr, which is uſually in twenty-four hours or a little more; the other three, when the liquor or *waſh* has come into high fermentation, which happens in a day or two longer. In four or five days after this, the operation is generally completed.

Obſervations on this Proceſs.

1. The addition of freſh matter to fermenting liquors, after the fermentation has ariſen to its height, is not the way to obtain the largeſt quantity of ſpirit that the ſubject is capable of yielding.

2. If the waſh proves viſcous or ropy, this proceſs will not have the due effect: in ſuch caſe, a proper quantity of warm water ſhould be added, and well mixed with the liquor.

3. If the liquor turns ſour in the proceſs, it is irrecoverably ſpoiled, and cannot, by any ſubſequent management, be made to afford a vinous ſpirit.

4. The chief precaution for preventing this inconvenience is cleanlineſs. The veſſels ſhould be perfectly well waſhed with fair water from all remains of former fermented matters, before any freſh is put into them. In many caſes, eſpecially if any liquor has already turned ſour in them, it will be uſeful to rince them after

the waſhing with a little lime water; but alcaline liquors and ſoap muſt be avoided: this laſt in particular has been found in a very remarkable manner to prevent fermentation.

5. If the veſſel is kept covered, and the proceſs carried on ſlowly, the product will be conſiderably more ſpiritous than when the fermentation is more haſtily performed. Some of the French planters ſeem to be ſenſible of the juſtneſs of this obſervation; and accordingly take care to cover the fermenting veſſels with boards and leaves of trees, and ſuffer the fermentation to continue in a ſlow manner for a conſiderable time.

6. The fermentation is known to be compleated, 1ſt, by the body of the liquor appearing fine, clear, and of a yellowiſh hue; 2dly, by its throwing up only a few clear beads to the top; 3dly, by its taſting quick, or without any admixture of ſweet, but not approaching to ſour, or ſharp; and 4thly, by its having a ſtrong penetrating ſmell.

3. *Of inflammable Spirits, the Products of Fermentation.*

All the ſubſtances capable of producing an inflammable ſpirit, chemically examined before fermentation, yield a conſiderable quantity of oil.

Inflammable ſpirits appear from experiment to be compoſed of the oil of the ſubject highly attenuated by the fermentation, and intimately combined with a large quantity of aqueous fluid.

The maſs of fermented liquor contains, beſides this ſpirit, a quantity of the oil not ſufficiently attenuated, of phlegm or water, and a groſſer fæculent matter.

The inflammable ſpirit is the lighteſt and moſt volatile of theſe ſubſtances, ſo as to exhale the moſt readily upon the application of heat; though if the degree of heat is conſiderable, a quantity of the phlegm and of the groſſer uncombined oily part will be elevated along with it.

The different flavours of ſpirits proceed from the admixture of this uncombined oil; when perfectly purified therefrom, they are all in every reſpect the ſame.

According as they contain more or leſs of this oil, they have likewiſe different degrees of tenacity and ſpecific gravity.

Theſe obſervations duly attended to would prevent ſome miſtakes, which the planters appear (from ſuch tracts as have been publiſhed on this head in the iſlands) to have fallen into; and at the ſame time lay a rational foundation for the proceſs which we are next to ſpeak of.

4. *The Diſtillation of the Fermented Waſh.*

The fermented liquor is conveyed fine (by means of cocks) into a large copper veſſel, or *ſtill*, ſet in a proper furnace, into which the copper is let down to about two thirds its height. The top of the ſtill is drawn up, tapering to an aperture (in the French iſlands) of about a foot diameter, on which is fitted a copper *head*, and the juncture luted with a fine loamy earth, or a paſte of flower and water. A pipe iſſues from the head, and fits into the end of another ſpiral pipe or *worm*, which is fixed in a tub of water. A ſuitable fire being applied under the ſtill, the ſpirit ariſes in ſteam, which being cooled in its paſſage through the worm, condenſes into a liquid form, and runs into a veſſel placed to receive it.

When all the ſpirit has come over, the matter which remains in the ſtill is let out by a pipe fixed in the bottom, and fitted with a cock for this purpoſe; and the ſtill charged afreſh.

The ſpirit thus obtained, is of the ſtrength vulgarly called *proof*, that is compoſed of about equal parts of pure ſpirit and water. That which ariſes at the begining of the diſtillation is generally ſomewhat ſtronger, but that which comes over towards the end, much weaker,ſo as to require being freed by a ſecond diſtillation from a part of its phlegm, in order to its being made up to proof.

Remarks on this Proceſs.

1. The ſtill ſhould not be filled above two thirds its height, leſt the waſh boil over in ſubſtance (which, in the language of the planters, is called the *ſpewing* of the ſtill.) This may likewiſe be prevented by the addition of a little butter or fat in it; unleſs the quantity of this addition be very ſmall,it will be apt to give the ſpirit a burnt flavour.

2. If the worm is not kept very cool by a continual ſupply of cold water, part of the ſpirit will eſcape in ſteam. It would be convenient to have a reſervoir above the tub, to be occaſionally ſupplied by pumping or otherwiſe; from this the water might fall in a conſtant ſmall ſtream, through a perpendicular pipe ſcattering near the bottom of the tub; the hot liquor, diſcharged at top, may in ſcarcity of water be reſerved for the ſame uſe again, when grown cold.

3. The fire ſhould be kept of ſuch a degree as to make the ſpirit run from the noſe of the worm in a continued ſtream. The author of an *Eſſay on Planterſhip* (which we have formerly had occaſion to mention) recommends the keeping the fire ſo high as that the ſtream may be “ near as big as the little finger :” he ſays, he “ has found from experience, that if the ſtream is varied to the bigneſs of a “ ſtraw, by an unequal fire, the ſpirit will become weak; but raiſe it again to the “ former ſtandard, and it will become proof.” It is nevertheleſs certain, that the weaker the fire, the ſtronger and purer will the ſpirit prove: to work with a degree of heat, even conſiderably leſs than that in which water boils, would be a capital improvement in this art, if it could be performed with the requiſite diſpatch. The ingenuous author was probably impoſed on by the common, but fallacious method of eſtimating the ſtrength of ſpirits, the *bubble-proof*. By this is underſtood a crown of bubbles, of a certain fire, ariſing upon a quantity of well-liquified ſpirits when ſhook in a vial; which bubbles, after remaining a while, go off in a particular manner, without growing leſs; if they are larger, and go off more ſuddenly, the ſpirit is ſaid to be *above proof*; when they are leſs, and go off fainter, *below proof*. Theſe appearances are manifeſtly owing to a greater or leſs tenacity of the ſpirit, occaſioned by its containing more or leſs of the groſs oil of the ſubject. A ſpirit, very far below proof, may by certain additions be made to appear above proof. And the ſtrongeſt ſpirit, perfectly freed by ſlow diſtillation from the oil naturally mingled with it, will appear below proof. As this oil is more ponderous than the pure ſpirit, the admixture of a greater or leſs quantity of it, will likewiſe occaſion a ſenſible difference in the apparent ſtrength of the ſpirit, when examined even by the hydrometer or hydroſtatic ballance. It is evident therefore from theſe obſervations, compared with the principles laid down in § 3 of this chapter, that 1ſt, the ſtronger the fire employed in the diſtil-

lation, the more of this oil will be forced over with the ſpirit; 2dly, that conſequently the ſpirit, though apparently ſtronger, will be in reality conſiderably weaker; 3dly, that ſpirits diſtilled with a ſtrong fire have a ſtronger, and generally leſs pleaſant flavour than thoſe drawn with a weak one.

4. The yield of ſpirit, where all the melaſſes and refuſe matters are applied to this uſe, is between ſixty and ſeventy gallons, from the melaſſes and other *offals* produced in the making of one hogſhead of ſugar. In Barbadoes, where the mill and boilers are frequently waſhed, and ſometimes a quantity of what they call *rotten* canes ground on purpoſe for fermentation, ſeventy-five gallons or more are obtained. In St. Chriſtopher's, and ſome other places, where greateſt part of the ſcums are given to the *ſtock* (or cattle) and the ſugar diſcharges but little melaſſes, the yield of rum upon the hogſhead of ſugar is ſcarce thirty gallons.

5. Some perſons have been lately reported to gain double the uſual quantity of ſpirit. The proceſs is doubtleſs capable of being improved; but it is probable, that this great increaſe was owing as much to a larger quantity of the ſaccharine matter being employed under the name of offals, as to any particular management of the artiſt. Melaſſes has been made to yield ſomewhat more than weight for weight of a merchantable proof ſpirit; and this ſeems to be nearly the utmoſt they are capable of producing. Our diſtillers hardly ever gain ſo much, and ſometimes ſcarce above half this quantity.

6. The lees, or matter remaining after the diſtillation, contains the groſſer fæculent ſubſtance of the waſh, a part of the phlegm and oil, and ſome portion likewiſe of the ſpirit. Hence it is advantageouſly employed in the ſubſequent fermentation, as diſpoſing the freſh waſh to ferment more readily, occaſioning the yield of ſpirit to be ſomewhat larger, and giving it likewiſe a degree of vinoſity. In order to have the lees fit for this uſe, two large ciſterns ſhould be made, capable of containing above thirty hogſheads each, well rammed with clay, ſo as to be ſufficiently tight. Into theſe the hot lees are to be diſcharged alternately from the ſtill, by means of a ſpout; after ſtanding till they are become cool and fine, the liquor is to be taken up clear, and reſerved for uſe in another ciſtern under cover.

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